551.590.2

SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING NOVEMBER, 1917.

By HERBERT H. KIMBALL, Professor of Meteorology.

[Dated: Washington, D. C., Dec. 31, 1917.]

For a description of instrumental exposures and an account of the methods of obtaining and reducing the measurements the reader is referred to the REVIEW for January, 1917, 45:2.

The monthly means and departures from normal values given in Table 1 show that direct solar radiation averaged below normal at all four stations.

Table 3 shows only a slight departure from the normal November radiation at Washington and a deficiency of about 11 per cent at Madison, Wis.

Skylight polarization measurements at Washington on 9 days give a mean of 52 per cent, with a maximum of 60 per cent on the 8th. This is considerably below the corresponding averages for November for Washington. At Madison measurements on 7 days give a mean of 60 per cent with a maximum of 71 per cent on the 20th.

TABLE 1.—*Solar radiation intensities during November, 1917.*

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Nov. 1		1.09	0.96	0.85						
2		1.16	1.07	0.99	0.90	0.83	0.76			
3		1.28	1.17	1.07	0.96	0.85	0.73	0.69	0.64	0.60
4			1.32	1.01						
5		1.48	1.38	1.26	1.18	1.10	1.04	0.99	0.94	0.89
6			0.92	0.87						
7			1.29	1.01	0.84		0.72			
8			1.29	1.22						
10			1.03	0.99						
17			0.97	0.78						
26				1.29	1.19					
Monthly means		1.25	1.14	1.03	1.01	0.93	0.81	(0.84)	(0.79)	(0.74)
Departure from 9-year normal		−0.12	−0.04	−0.06	−0.01	+0.02	−0.03	+0.04	+0.04	+0.04
P. M.										
Nov. 3			1.05	0.96	0.89	0.78				
5				1.22	1.15	1.09	1.03	0.97	0.92	0.87
6			0.96							
7			1.21	1.08	1.00	0.96	0.90	0.84	0.79	0.74
10			1.00	0.71	0.63					
12			0.63							
17			1.00	0.90	0.84	0.79	0.71	0.63	0.58	
Monthly means			0.98	0.97	0.90	0.90	0.88	0.81	0.76	(0.80)
Departure from 9-year normal			−0.20	−0.11	−0.07	±0.00	+0.06	+0.04	+0.04	+0.11

TABLE 1.—*Solar radiation intensities during November, 1917.*—Contd.

Madison, Wis.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Nov. 3			1.26				0.91	0.83	0.75	0.68
5			1.10	0.96						
16			1.31	1.24	1.21	1.13	1.07	1.01	0.94	
20			1.28	1.18	1.09	1.02	0.95	0.89	0.83	0.81
Monthly means			1.24	1.13	(1.15)	(1.08)	0.98	0.91	0.84	(0.74)
Departure from 8-year normal			−0.05	−0.07	+0.01	−0.06	−0.04	−0.05	±0.00	−0.03
P. M.										
Nov. 5				0.96						
16				1.12	0.99					
20				1.19	1.12					
Monthly means				1.09	(1.06)					
Departure from 8-year normal				−0.14	−0.11					

Lincoln, Nebr.

A. M.										
Nov. 5			1.25	1.20	1.11	0.98	0.89			
6			1.24	1.17	1.03	0.91				
16			1.12	1.03		0.80	0.70			
18			1.45	1.31	1.18					
Monthly means			1.26	1.18	1.11	0.90	(0.80)			
Departure from 3-year normal			−0.10	−0.14	−0.14	−0.24	−0.27			
P. M.										
Nov. 2			1.37	1.24	1.18	1.10			0.94	
3					1.13	1.03	0.94	0.85	0.78	0.71
5				1.26	1.14	1.05	0.98	0.91	0.85	0.81
6				1.10	1.00	0.91	0.83	0.78	0.70	
7			1.18	1.07	0.98	0.90				
14			1.14	0.85						
Monthly means			1.23	1.10	1.09	1.00	0.92	0.85	0.82	(0.76)
Departure from 3-year normal			−0.17	−0.19	−0.12	−0.13	−0.15	−0.15	−0.12	−0.18

TABLE 1.—*Solar radiation intensities during November, 1917*—Contd.

Santa Fe, N. Mex.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	65.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Nov. 1	......	1.50	1.36	......	......	......	......	......	......	......
3	......	1.58	......	......	......	1.24	1.19	......	1.15	......
5	......	1.50	1.38	......	......	......	......	......	......	......
6	......	1.45	1.39	......	......	1.29	1.22	1.14	......	......
8	......	1.52	1.39	......	......	1.20	1.13	1.07	1.01	......
16	......	......	1.24	......	......	......	1.11	......	......	......
19	......	......	......	......	......	......	......	......	1.13	1.01
21	......	......	......	......	......	1.31	1.22	1.15	......	......
Monthly means	......	1.51	1.35	......	......	1.26	1.17	1.12	1.10	(1.01)
Departure from 6-year normal	......	−0.05	−0.12	......	......	−0.01	−0.03	−0.02	−0.06	......
P. M.										
Nov. 1	......	......	1.43	1.31	1.27	1.21	1.14	1.09	......	......
3	......	......	1.38	1.35	1.26	1.16	1.13	......	......	......
5	......	......	1.44	1.34	1.23	1.13	......	......	......	......
8	......	......	......	......	1.25	......	......	......	......	......
12	......	......	......	......	1.17	1.12	1.04	0.97	......	......
16	......	......	......	......	......	1.17	1.13	......	......	......
20	......	......	......	1.39	1.30	1.21	......	......	......	......
22	......	......	......	......	1.27	1.23	1.17	......	......	......
23	......	......	1.44	1.38	1.32	1.27	......	......	......	......
Monthly means	......	......	1.42	1.36	1.26	1.19	1.12	(1.03)	......	......
Departure from 2-year normal	......	......	−0.03	−0.04	−0.04	−0.04	−0.04	−0.08	......	......

TABLE 2.—*Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C. Dates.	8 a. m.	8 p. m.	Madison, Wis. Dates.	8 a. m.	8 p. m.	Lincoln, Nebr. Dates.	8 a. m.	8 p. m.	Santa Fe, N. Mex. Dates.	8 a. m.	8 p. m.
1917.	*mm.*	*mm.*	1917.	*mm.*	*mm.*	1917.	*mm.*	*mm.*	1917.	*mm.*	*mm.*
Nov. 1	4.37	3.15	Nov. 3	3.81	5.36	Nov. 2	3.15	4.57	Nov. 1	2.49	3.15
2	3.15	3.00	5	4.75	6.50	3	3.99	4.57	3	3.45	2.62
3	3.99	4.37	16	4.95	6.76	5	4.57	2.74	5	2.49	2.26
4	3.63	4.37	20	4.37	6.76	6	4.17	5.56	6	1.88	2.36
5	3.30	4.57	......	......	......	7	2.36	7.57	8	1.96	3.45
6	3.99	4.95	......	......	......	14	4.57	5.79	12	3.81	3.63
7	4.37	3.15	......	......	......	16	5.16	12.68	16	3.63	2.36
8	2.74	3.45	......	......	......	18	3.99	2.87	19	2.74	2.87
10	3.99	5.79	......	......	......	......	......	......	20	2.87	3.00
12	5.56	7.04	......	......	......	......	......	......	21	2.06	2.74
17	4.37	5.56	......	......	......	......	......	......	22	2.49	3.45
26	3.45	2.36	......	......	......	......	......	......	23	2.87	3.00

TABLE 3.—*Daily totals and departures of solar and sky radiation during November, 1917.*

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals. Washington.	Madison.	Departures from normal. Washington.	Madison.	Excess or deficiency since first of month. Washington.	Madison.
1917.	*calories.*	*calories.*	*calories.*	*calories.*	*calories.*	*calories.*
Nov. 1	268	151	7	−46	7	−46
2	315	177	58	−18	65	−64
3	315	265	62	73	127	9
4	350	244	101	55	228	64
5	345	261	100	75	328	139
6	259	205	17	21	345	160
7	306	50	67	−131	412	29
8	329	137	92	−41	504	−12
9	246	178	12	2	516	−10
10	268	150	37	−23	553	−33
11	218	205	−11	34	542	1
12	195	38	−31	−130	511	−129
13	56	55	−167	−110	344	−239
14	195	119	−25	−44	319	−283
15	230	222	12	62	331	−221
16	198	222	−17	64	314	−157
17	231	195	19	39	333	−118
18	254	203	44	49	377	−69
19	246	112	39	−40	416	−109
20	237	204	32	54	448	−55
Decade departures					−105	−22
21	104	154	−98	6	350	−49
22	154	63	−46	−83	304	−132
23	206	131	9	−13	313	−145
24	104	99	−91	−43	222	−188
25	260	88	68	−52	290	−240
26	225	112	35	−27	325	−267
27	159	43	−29	−94	296	−361
28	52	115	−134	−21	162	−382
29	31	55	−153	−80	9	−462
30	13	66	−169	−68	−160	−530
Decade departures					−608	−475
Excess or deficiency since first of year. gr.-cal.					−6,768	+147
per cent					−5.5	+0.1

OBSERVATIONS OF THE NEUTRAL POINTS OF ATMOSPHERIC POLARIZATION FROM GREAT HEIGHTS.[1]

By A. WIGAND.

[*Reprinted from* Science Abstracts, Sect. A, Sept. 29, 1917, §866.]

Observations of the positions of the neutral points of Arago and Babinet were made in the early morning of May 3, 1914, from a free balloon. The balloon started from Bitterfeld at 3:14 a. m., Middle European Time, and observations of polarization were obtained from 3:59 to 5:35 a. m., during which time the balloon rose from 3,100 to 5,850 meters. The angular distances of Arago's Point are plotted against the elevation of the sun and compared with corresponding observations made on the earth's surface, showing that the elevation from which the observations were made did not affect the position of the neutral point. Similarly the distances of Babinet's Point from the sun are shown to be unaffected by variation in height of the point of observation, within the limits of accuracy of observation.

The conclusion provisionally drawn from the few observations available is that the phenomena of polarization do not belong exclusively to the lower layers. As they show no appreciable change in the first 6,000 meters they are possibly to be considered as a property of the stratosphere.—*R. Corless*.

SOME NUCLEI OF CLOUDY CONDENSATION—III.[2]

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By J. AITKEN.

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The nuclei of the atmosphere, formerly termed by the author dust particles, but now recognized to be very much smaller than the ordinary particles of dust raised in a wind, have been the subject of a good deal of investigation. Of late it has been definitely stated by some workers that these nuclei are mere aggregations of ions and not of the nature of dust particles. The present investigation was carried out to test this theory, and incidentally many subsidiary experiments were made. A new piece of apparatus was devised in which the saturated sample of air in a test flask could readily and almost instantaneously be expanded, and thus given any degree of supersaturation within reasonable limits. The "size" of the nuclei is measured by the degree of supersaturation required to produce condensation upon them, a 2 per cent expansion of the air in the test flask being sufficient to cause condensation upon the larger nuclei, while higher degrees of supersaturation are required for the smaller ones, until a 25 per cent expansion is required to produce condensation on individual ions. The "size" of the nuclei measured in this way does not necessarily mean the relative dimensions, though probably not far from it.

With the aid of the new apparatus tests were made on the effect of heat acting on different materials, as a nucleus producer. It was found that when any material became sufficiently heated to cause an alteration in the flame in contact with it then nuclei were produced. This held in the case of glass, porcelain, alundum, and also with copper and other metals. This production of nuclei from heated surface affords some explanation of the wearing away of bars of grates and linings of furnaces in cases where these are not exposed to friction. Some metals, as magnesium, were found to have the

[1] Physikal. Ztschr., June 1, 1917, 18: 237-240.
[2] Proc., Roy. soc., Edinburgh, 1916-1917, 37: 215-245.